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Beijing's diagnosis-related group payment reform pilot: Impact on quality of acute myocardial infarction care

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ABSTRACT

In 2012, China's first diagnosis-related group (DRG) payment system was piloted in Beijing. This study explored whether this payment pilot improved quality and reduced costs of acute myocardial infarction (AMI) care in hospitals implementing DRG payment as compared to control hospitals. A difference-in-difference study design was used with regression and considered several quality indicators including aspirin at arrival, aspirin at discharge, β-blocker at arrival, β-blocker at discharge, statin at discharge, in-hospital mortality, and 30-day readmission rates. DRG payment mechanisms without specific mechanisms to promote care quality did not improve quality of AMI care. Future studies should study the impact of cost control mechanisms together with quality improvement efforts to assess how quality of care may be improved within the Chinese healthcare system. These lessons would be helpful to share with lower-middle-income countries undergoing rapid development that are transitioning to a significantly higher burden of non-communicable diseases.

1. Background

According to the 2010 WHO report, improving the performance of health systems is a cornerstone of health reform, which includes improving both the efficiency and quality of healthcare (WHO, 2010). Quality of care (QoC) is directly related to health outcomes, and thus should receive significant attention.

Health systems in many industrialized countries have undergone reforms from retrospective payment to prospective payment systems (CPC Central Committee and the State Council, 2009; State Council of the People's Republic of China, 2015). Diagnosis related groups (DRGs) (Busse et al., 2013) have been introduced in many of these countries as a payment system that encourages health care providers to assume financial risks, which can motivate providers towards greater efficiency through controlling costs (Kahn et al., 1992), while improving quality of care (Davis and Rhodes, 1988). In recent years, there has been increasing interest in lower-middle-income countries (LMICs) to introduce DRGs in order to control costs (Mathauer et al., 2013). Policymakers, however, have paid more attention on the potential for DRG payment for cost control, but have paid much less attention on the potential to improve quality of care. In the early stages of DRG introduction in the United States through Medicare payment, Rock expressed concerns that the economic pressure of DRG payment might adversely affect quality of care (Rock, 1985). The focus of DRG impact on care quality has been primarily in higher income countries (Kahn et al., 1990). Research in LMICs with health systems in transition due to the rapid pace of economic development is severely lacking.

The Chinese government plans to roll out DRG payment nationwide to replace traditional fee-for-services payment, which has significantly driven up the costs of care in China (General Office of the State Council, 2017). The DRG pilot in China has previously shown its potential to reduce health expenditures and out-of-pocket costs (Jian et al., 2015). There have been no studies in China on the impact of DRG payment on care quality. Before broader implementation of policies promoting DRG payment, it is important to study the challenges to implementation as well as potential impact on quality of care. China is committed towards the introduction of DRG payment. Research, however, is needed to inform China's health system overhaul, which is an important part of China's continued development and economic transition.

This study assessed the impact of DRG payment reform pilots in

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Beijing on quality of acute myocardial infarction (AMI) care. China's Ministry of Health in 2011 released the "Tertiary Hospital Accreditation Criteria," which proposed for the first time, measurement of process indicators in China. These included AMI, congestive heart failure, stroke, and pneumonia. Amongst these, only AMI was covered through Beijing's DRG payment pilot in 2012. AMI was therefore chosen for this study to assess for quality improvement in the setting of DRG payment reform. Given an essential lack of a quality improvement system in China, this work features some of the first opportunities available in China to develop and implement a system to improve quality of care. Efforts to measure and improve care quality in China have been few and limited, and adequate process measures are greatly needed in China. We hope that this study will share lessons on how to develop these systems in countries with healthcare systems undergoing major social and economic transitions to promote opportunities for reform and improvement of healthcare systems.

2. Methods

2.1. Study design

Six DRG pilot hospitals and 8 control hospitals were matched according to annual inpatient and outpatient load, number of beds, and clinical and administrative personal. Pilot hospitals implemented DRG payment for 108 specific conditions and procedures beginning in October 2011. These DRGs had been selected by the Beijing Health Insurance Bureau to pilot given higher within-group homogeneity as confirmed by the coefficient of variation (< 0.85). 'Potential DRG cases' refers to cases at pilot hospitals eligible for DRG-payment as well as corresponding cases at control hospitals, though control cases were paid through fee-for-service (FFS) mechanisms. DRG cases post-reform actually paid through DRG payment were considered 'DRG payment cases.' Post implementation of reform, about 1/3 of potential DRG payment cases at pilot hospitals were in actuality paid through a FFS mechanism due to difficulties in billing implementation despite DRG eligibility, which was a major flaw in reform design. These cases are designated 'FFS reversion.' It has shown in previous studies that older, higher number of more comorbidities, and more severe cases have a greater probability of being paid through FFS. Further details on DRG payment design and FFS reversion have been described previously (Jian et al., 2015).

We compared the characteristic difference between FFS reverted cases and DRG payment cases. Due to data limitations, we can only examine the differences in age, gender, and treatment of AMI cases (see Appendix Table 1). There were no significant differences in age distribution between the two groups; more women were reverted to FFS as were more coronary artery bypass grafting (CABG) cases. Reasons for this may include the lack of ability to recognize AMI in women, who may present atypically. Additionally, CABG cases may be more expensive, which may have stimulated the FFS reversion. Although there was no direct evidence, the fact that the proportion of CABG was relatively high suggested that severe AMI cases may be reverted to FFS.

It is worth noting that the process quality measures we use are suitable for all AMI cases (whether mild or severe). In other words, the severity of the condition does not affect these measures. Therefore, even if some severe cases are reverted to FFS, the conclusion will not be affected.

2.2. Setting and participants

The Beijing Health Insurance Bureau administers health insurance through the Beijing Employee Basic Health Insurance Scheme (BEBHIS), which covers 12 million people or 60% of the city's population. Discharge data for BEBHIS patients were obtained from 14 tertiary general hospitals over the period of January 2010 to September 2012.

2.3. Variables

Several process and outcome quality indicators were used based upon National Quality Forum endorsed indictors, which are evidence-based and have been validated (Cardiovascular Disease Branch of Chinese Medical Association, 2001, 2015; National Quality Forum, 2015; O'Gara et al., 2013; Sun et al., 2011). The majority of indicators are based off of indicators from the United States Centers for Medicare and Medicaid Services or from the American College of Cardiology (Centers for Medicare & Medicaid, 2016). They are: 1) aspirin at arrival (percentage of AMI patients who received aspirin within 24 h before or after hospital arrival); 2) β blocker at arrival (percentage of AMI patients who received β-blocker within 24 h before or after hospital arrival); 3) Aspirin prescribed at discharge (percentage of AMI patients who are prescribed aspirin at hospital discharge); 4) β-blocker prescribed at discharge (percentage of AMI patients who are prescribed a β-blocker at hospital discharge); 5) statin medication at discharge; 6) in-hospital mortality, and 7) readmission rate within 30 days.

Better quality was represented by lower in-hospital mortality rate and lower readmission rates. It was also represented by higher percentages of aspirin at arrival, β-blocker at arrival, aspirin prescribed at discharge, β-blocker prescribed at discharge, and statin at discharge.

2.4. Statistical methods

The pre- and post-reform periods were compared applying a difference-in-difference (DID) methodology to assess if DRG payment stimulated improvement in quality of PCI and CABG procedures for AMI. Baseline differences as well as trend differences over time between pilot and control hospitals were controlled for through the DID method to increase the validity of estimated impacts.

Two outcome indicators (in-hospital mortality and 30-day all-cause readmission rate) and five process indicators (aspirin at arrival, β blocker at arrival, aspirin prescribed at discharge; β-blocker prescribed at discharge, and statin medication at discharge) were included. Linear probability regression analyses were conducted based on the following formula:

$$Y_{it} = \alpha + \beta 2T2 + \beta 3RH + \delta T2{*}RH + \omega X, \quad (1)$$

where T2 = 1 if year = 2012, T2 = 0 if year = 2010 or year = 2011; RH = 1 if 6 pilot hospitals; T2 * RH is the DID variable and its coefficient δ represents the effect of DRG payment. X comprises a set of control variables including gender, age and the square of age. In order to test if pre-reform trends between pilot and control hospitals were similar as part of assessing for DID parallel trends, we used two points of data from before the intervention (2010 and 2011). We can augment equation (1) in the following manner:

$$Y_{it} = \alpha + \beta 1T1 + \beta 2T2 + \beta 3RH + \delta 1T1 * RH + \delta 2T2 * RH + \omega X, \quad (2)$$

where, T1 = 1 if year = 2011; T2 = 1 if year = 2012. If δ1 = 0, the parallel-trend assumption holds and δ2 can be interpreted as the DRG effect. If δ1 = 0 does not hold, then the true effect of the DRG intervention is the net of δ2 and δ1.

All analyses were conducted using Stata 12.0 (College Station, Texas).

3. Results

3.1. Descriptive data

Table 1 presents descriptive statistics for DRG cases. AMI diagnoses were based upon discharge diagnosis and included both ST elevation acute myocardial infarction (STEMI) and non-ST elevation acute myocardial infarction (NSTEMI). Post-reform in 2012, there were a total of 1,374 acute myocardial infarction (AMI) cases at pilot hospitals eligible

Table 1
Descriptive statistics of the sample characteristics, costs, outcomes, medication prescription, and procedure type pre- and post-reform in pilot and control hospitals, 2010–2012, Beijing, China.

		2010 and 2011		χ^2/*t*-test (p-value)	2012		χ^2/*t*-test (p-value)
		Pilot hospitals	Control hospitals		Pilot hospitals	Control hospitals	
Total Potential DRG or DRG Cases		2,196	2,198		1,374	1,351	
Gender (N, %)	Male	1,714 (78.1%)	1,805 (82.12%)	11.405 (0.001)	1,082 (78.8%)	1,129 (83.8%)	10.339 (0.001)
	Female	482 (22.0%)	393 (17.9%)		292 (21.3%)	222 (16.4%)	
Age (N, %)	19–40	64 (2.9%)	78 (3.6%)	6.437 (0.092)	46 (3.4%)	53 (3.9%)	5.562 (0.135)
	41–60	1,024 (46.6%)	1,082 (49.2%)		634 (46.1%)	672 (49.7%)	
	61–80	1,036 (47.2%)	974 (44.3%)		629 (45.8%)	559 (41.4%)	
	> 80	72 (3.3%)	64 (2.9%)		65 (4.7%)	67 (5.0%)	
Procedure type and complications							
CABG (N, %)		143 (6.5%)	215 (9.8%)	70.387 (< 0.001)	84 (6.1%)	112 (8.3%)	23.889 (< 0.001)
Uncomplicated PCI with stent (N, %)		135 (6.2%)	73 (3.3%)		69 (5.0%)	26 (1.9%)	
Complicated PCI with stent (N, %)		1,918 (87.3%)	1,910 (86.9%)		1,221 (88.7%)	1,213 (89.8%)	
Indicators							
Aspirin at arrival		2077 (94.6%)	1972 (89.7%)	35.908 (< 0.001)	1328 (96.7%)	1281 (94.8%)	5.6185 (0.018)
Aspirin prescribed at discharge		2031 (92.5%)	2037 (93.1%)	0.682 (0.409)	1279 (93.1%)	1295 (95.9%)	9.9789 (0.002)
B-blocker at arrival		1474 (67.1%)	1361 (61.9%)	12.986 (< 0.001)	976 (71.0%)	995 (73.7%)	2.328 (0.127)
B-blocker prescribed at discharge		1688 (76.9%)	1740 (79.2%)	3.376 (0.066)	1071 (78.0%)	1111 (82.2%)	7.849 (0.005)
Discharged on Statin Medication		1866 (85.0%)	1805 (82.0%)	6.502 (0.011)	962 (70.0%)	877 (64.9%)	8.074 (0.004)
In-hospital mortality (N, %)		43 (2.0%)	35 (1.6%)	0.843 (0.359)	13 (1.6%)	21 (1.0%)	3.447 (< 0.001)
Readmission rate within 30 days (N, %)		63 (2.9%)	78 (3.6%)	1.635 (0.201)	36 (2.6%)	60 (4.4%)	6.647 (0.010)

for DRG payment. These 4 DRGs included: complicated PCI with stent (N = 1221, 88.9%), uncomplicated PCI with stent (N = 69, 5.0%), CABG (N = 84, 6.1%), and CABG without cardiac catheterization (N = 27, 2.0%). In the period before implementation, all cases in the pilot and control hospitals received FFS payments. In the period after implementation, 71.1% of the cases that were eligible to receive DRG payments did receive them, while 28.9% were FFS reversion cases (data not shown).

In 2012, the proportion of aspirin prescribed at arrival, β-blocker prescribe at arrival, aspirin prescribed at discharge, β-blocker prescribed at discharge, and statin prescribed on discharge in the AMI cases of pilot hospitals were 96.7%, 71.0%, 93.1%, 78.0% and 70.0% respectively. The first four indicators improved after the DRG payment reform in both the pilot hospital and the control hospitals, while the last indicator has worsened in both the pilot hospital and the control hospital. The in-hospital mortality fell from 2.0% before the reform to 1.6% after the reform in pilot hospitals, while it fell from 1.6% to 1.0% in control hospitals. The 30-day readmission rate fell from 2.9% before the reform to 2.6% after the reform in pilot hospitals, while it rose from 3.6% to 4.4% in control hospitals.

3.2. Main results

Fig. 1 shows the impact of this DRG payment reform on the in-hospital mortality and 30-day readmission rates for DRG eligible AMI cases. From the results of DID regression analysis, the impact of reform is not obvious for the DRG eligible cases, DRG payment cases and FFS reversion cases (data not shown).

DRG payment, however, has an impact on the quality of process indicators of AMI cases. Fig. 2 shows the analysis of DRG eligible cases. For the cases of PCI with stents that had complications, which were eligible to be paid for through DRG, 67.6% received β-blocker within 24 h of admission. This was an increase from 62.5% before the DRG payment (from 2010 to 2011). This improvement, however, has stagnated, and β-blocker prescriptions post-reform in 2012 have fallen back to pre-reform levels in 2010. For the PCI cases with stent placement that were uncomplicated, the proportion of patients who received aspirin within 24 h of admission fell from 91.5% to 87.5% after the DRG reform. For CABG cases, those who received β-blocker within 24 h of admission had an upward trend before the reform from 69.6% in 2010 to 76.9% in 2011, but were lower after the reform with 66.8% in 2012.

For cases paid through DRG payment, several indicators had similar trends (Fig. 3). For PCI cases with stent placement that had complications, β-blocker on arrival, β-blocker at discharge, and statin medication at discharge had shown trends in increase pre-reform (from 62.5% to 67.7%, 79.0%–84.4%, and 71.8%–77.0% respectively). These indicators, particular that of β-blocker prescription on arrival, however, fell after the reform. For PCI cases with stent placement that were uncomplicated, rates of aspirin on arrival decreased significantly after the reform from 93.3% to 86.9%. Discharge on a statin medication had been increasing before the reform from 75.9% to 80.5%, but fell back after the reform to 73.4% in 2012. For CABG, the levels of β-blocker on arrival showed increases before the reform but fell after the reform.

Fig. 4 shows the changes in the quality of FFS-reversion process indicators before and after the reform, which show a very different trend from DRG payment cases. In contrast to DRG payment, there were no trends toward improvement pre-reform with decline post-reform. In FFS reversion cases, trends of improvement (including discharged on a statin for uncomplicated PCI and CABG cases) pre-reform continued post-reform, and there were a few indicators that were improved post-reform including β-blocker at arrival for CABG cases, and β-blocker for both complicated and uncomplicated PCI cases.

4. Discussion

This is the first study on the impact of DRG payment on quality of care in China. We examined AMI cases due to the standardization of diagnosis and treatment processes (Gao et al., 2008) and availability of clear process and quality indicators of hospitalized AMI patients (Jian et al., 2009; Jiang et al., 2015; Li et al., 2015; Pena et al., 2010; Zheng et al., 2016). We found that for cases of PCI with stent placement that had complications, the rates of β-blocker prescriptions on arrival and β-blocker prescriptions at discharge trended towards improvement before the reform. After the implementation of DRG payment, however, this improvement stagnated, with lower rates of prescriptions for aspirin on arrival for PCI cases with stent placement that were uncomplicated. For cases DRG eligible but ultimately paid through FFS reversion, none of the quality indicators were found to be significantly lower than the baseline period or improved after the reform in both PCI and CABG cases. Although DRG payment did not affect outcomes of in-hospital deaths and 30-day readmissions, the results suggest that increasing hospital awareness of cost control through DRG payment alone without specific efforts to promote quality may be a barrier to quality improvement.

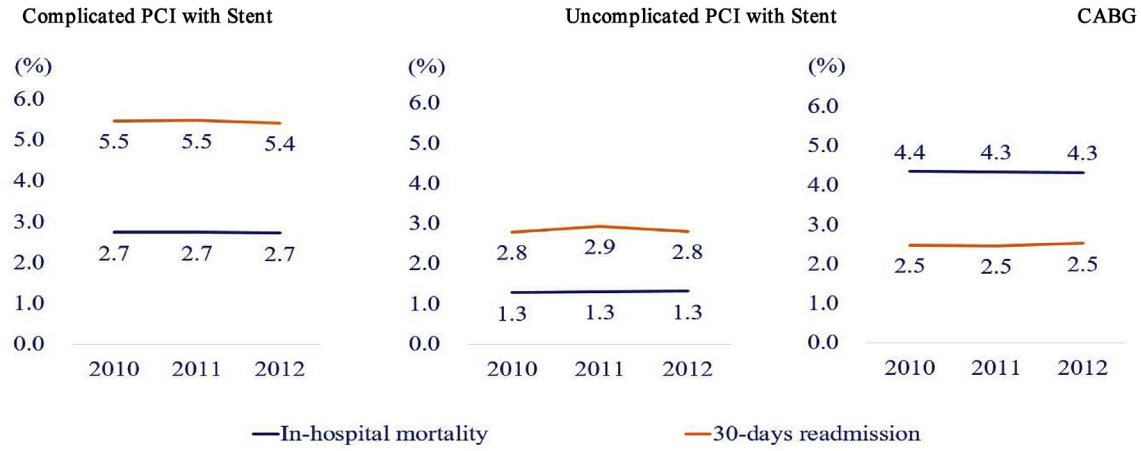

Fig. 1. Effect of DRG payment on in-hospital mortality and 30-days readmission of DRG eligible AMI cases, including complicated PCI with stent, uncomplicated PCI with stent, and CABG between pilot and control hospitals, 2010–2012. NOTES: We used regression to determine the percentages of change based on estimated difference-in-differences between the pilot and control hospitals, controlling for patients' age and sex.*p < 0.1, **P < 0.05, ***p < 0.01.

Payment systems may affect treatment behaviors of providers, which may affect quality in the setting of payment reform. In shifting from FFS to DRG payment, financial risks borne by providers increase significantly, which gives providers more incentive to actively control costs. DRG payment systems promote efficiency without sacrificing quality by motivating providers to reduce unnecessary services. Quality, however, is impaired if necessary services are reduced (Cots, n.d.; Lave J, 1989; Busse et al., 2013), as we found in this study. This effect, however, is not easy to observe (Busse et al., 2013; Kim et al., 2016). Quality outcomes such as mortality and readmission rates that are used to measure DRG payment impact are helpful indicators but are not sensitive as process indicators to effectively assess the impact effect on quality (Forgione et al., 2005). In prior studies, only a few outcome indicators found improvements in quality (Forgione et al., 2004). For example, a review of studies in OECD countries (Forgione et al., 2004) found that DRG payment was associated with slower quality gains with respect to patient mortality from surgical and medical adverse events. Another study in Japan (Hamada et al., 2012) found that DRG payments increased the rate of readmissions. Most studies on outcome indicators have not found significant impact on quality by DRG payment (Forgione et al., 2004; Brügger, 2010). Process indicators have been underutilized in studies of quality improvement in DRG payment systems. Pairing outcome and process indicators to assess for quality improvement as in this study may be helpful for deepening the understanding of how this payment system may improve quality of care (Ranasinghe et al., 2014; Wang, 2014; Wang et al., 2014).

Our findings in this study using process indicators suggests that DRG payment may affect processes for diagnosis and treatment. Five process indicators for quality assessment were used in this study. These included aspirin prescribed on arrival, β-blocker prescribed on arrival, aspirin prescribed at discharge, β-blocker prescribed at discharge, and statin prescribed at discharge, which are all considered necessary services for the treatment of AMI. Our results found that after DRG payment implementation, hospitals had a tendency to reduce provision of some of these critical medications, which ultimately reduced quality of care.

Some research suggests that DRG payment may not always improve quality, similar to the findings in our study though research using quality indicators has been limited. A series of papers published in JAMA (Kahn et al., 1990) showed that after the introduction of DRG payment, the likelihood of patients discharged home in an unstable condition was increased. In Swedish, a study (Ljunggren and Sjödén, 2010) showed that patient satisfaction decreased after the introduction of DRG payment. A French study (Or, 2014) suggested that existing

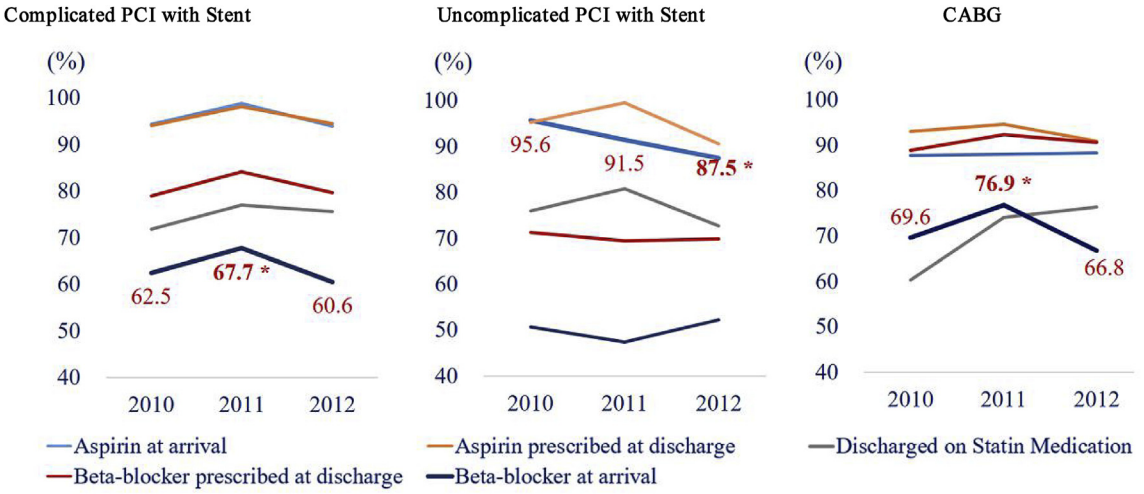

Fig. 2. Effect of DRG payment on process quality of DRG eligible AMI cases, including complicated PCI with stent, uncomplicated PCI with stent, and CABG between pilot and control hospitals, 2010–2012. NOTES: DRG-eligible cases are AMI cases eligible for DRG payment but may have been ultimately paid through either DRG or FFS mechanisms. We used regression to determine the percentages of change based on estimated difference-in-differences between the pilot and control hospitals, controlling for patients' age and sex. Only the indicator with statistically significant differences are marked in the figure.*p < 0.1, **P < 0.05, ***p < 0.01.

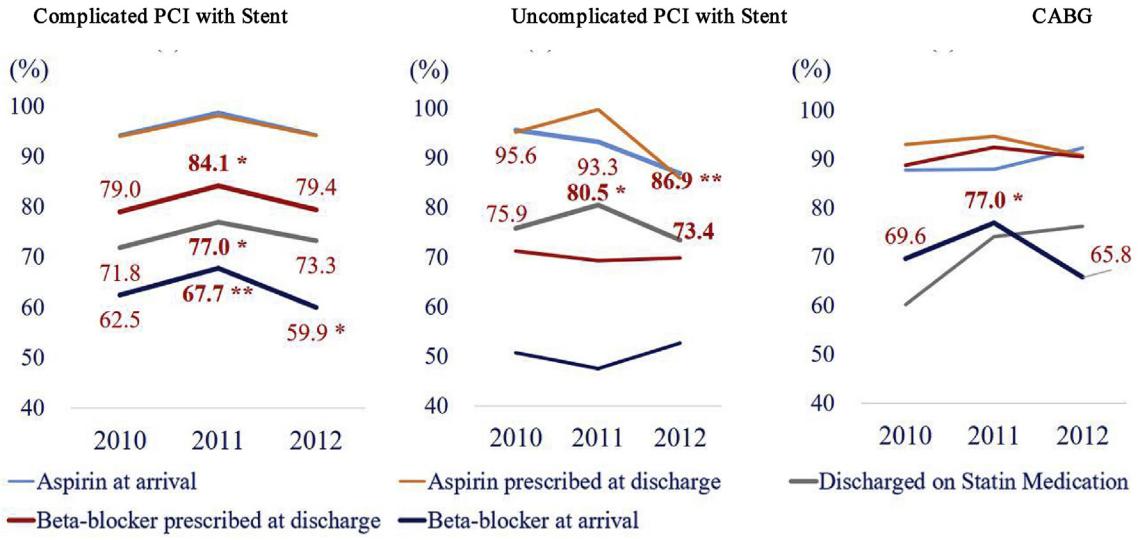

Fig. 3. Effect of DRG payment on process quality of DRG payment AMI cases, including complicated PCI with stent, uncomplicated PCI with stent, and CABG between pilot and control hospitals, 2010–2012. NOTES: DRG payment cases were paid through DRG payment mechanisms. We used regression to determine the percentages of change based on estimated difference-in-differences between the pilot and control hospitals, controlling for patients' age and sex. Only the indicator with statistically significant differences are marked in the figure.*p < 0.1, **P < 0.05, ***p < 0.01.

challenges to ensure medically appropriate care were actually worsened after the implementation of DRG payment. This prior research suggests that there may be a role for using process indicators to assess impact on quality. Similar to findings in this study, DRG payment may not necessarily improve care quality.

Motivation for cost reductions in the setting of DRG payment may be driving these reductions in prescription of critical medications, which can negatively impact quality of care. Quality improvement systems are urgently needed to coincide with DRG payment implementation in China to ensure that quality of care is not being sacrificed in order to have improved cost control.

4.1. Policy implications

With strong purchasing and negotiating power, large health insurers can be a powerful driving force for improving quality of care. This includes maximizing potential for serving as a buyer of health services while navigating shifting from fee-for-service to bundled payments. The establishment of quality improvement systems with partnerships between providers, insurers, and government regulatory agencies is critical, to monitor and improve quality as well as mitigate any potential negative impacts of emphasizing cost control over quality (Yip et al., 2012; Yip and Hsiao, 2014). In OECD countries, the introduction of DRGs had led to improvements in coding quality as well as the quality of medical data. DRG medical data can allow measurement of quality on a routine basis by using existing data within the health system. Such quality monitoring systems has been increasingly used in Germany, Switzerland and Austria (Busse et al., 2009). Use of routinely collected data to monitor for gaps in quality is incredibly important as part of a system to use this data to provide higher quality of care.

It is also necessary to consider introducing “pay by performance evaluations". In the design of pay-for-performance, objective quality indicators, including outcome indicators and process indicators, are used as the core basis for measuring performance for provider. These

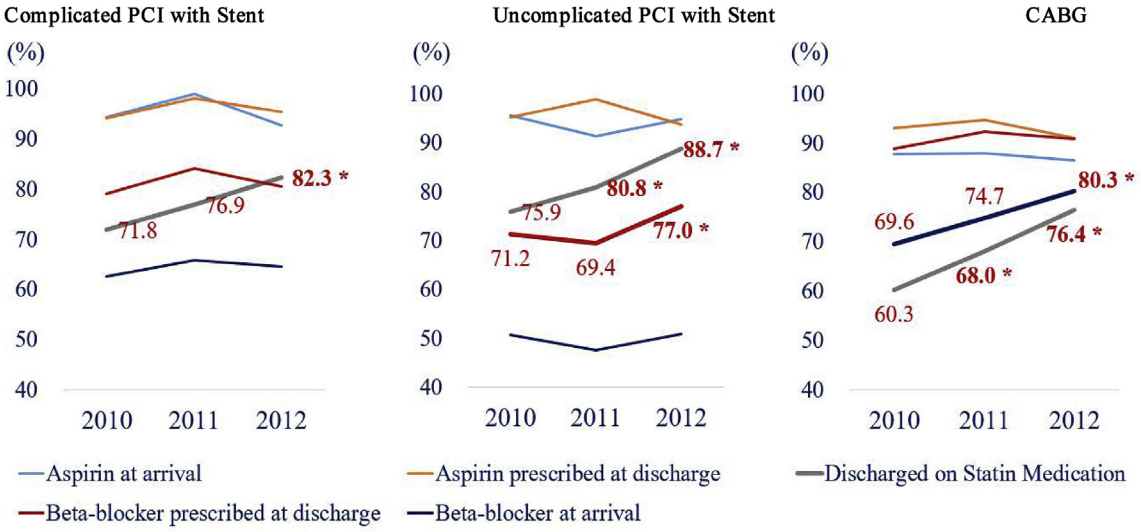

Fig. 4. Effect of DRG payment on process quality of FFS-reversion AMI cases, including complicated PCI with stent, uncomplicated PCI with stent, and CABG between pilot and control hospitals, 2010–2012. NOTES: FFS reversion are DRG-eligible cases that were ultimately paid through FFS mechanisms. We used regression to determine the percentages of change based on estimated difference-in-differences between the pilot and control hospitals, controlling for patients' age and sex. Only the indicator with statistically significant differences are marked in the figure.*p < 0.1, **P < 0.05, ***p < 0.01.

providers in turn receive higher compensation by providing higher-quality care. Under such an incentive mechanism, the provider is incentivized to meet the quality standards in order to obtain full payment, which motivates providers to proactively maintain and improve the quality of care. Currently, higher income countries have greater levels of experience (Busse, 2011) with pay for performance. For example, within the Commission for Quality and Innovation (CQUIN) framework of the UK (Department of Health, 2012), DRG based payments can be increased at the hospital level if hospital quality indicators are able to demonstrate high quality. Payments to a hospital for all patients falling into one DRG can be increased if the hospital scores above average on DRG specific quality indicators. For example, in Germany a pay for quality contract between a large insurer and a hospital in Karlsruhe awarded higher payments for bypass surgery if in-hospital mortality and post-surgical mediastinitis were below the German average.

There are several limitations to this study that should be considered. First, although all the hospitals in the DRG pilot were included in this study, this was not a random sample of all the hospitals in Beijing, since randomization is not possible with natural experiment studies. We used 8 local comparable hospitals as control groups and controlled time trends through the difference-in-difference model to limit the potential bias. Second, data were limited by information based upon claims data at discharge available through the Beijing Health Insurance Bureau. Claim data is only accurate to “hours” for the execution time of the treatment measures. Therefore, measurements cannot be made for indicators requiring specific time measurements of shorter duration. Third, because our data was based on billing, we were unable to capture if this payment systems were turning away sicker patients. Only patients who had been admitted and paying through FFS or DRG payment were included. Fourth, nearly 29% of AMI DRG cases post-reform were reverted to FFS payment mechanism, which was a significant bias in a reform design. Using our data, we can see cases of DRG payment and FFS reversion have no difference in age and gender distribution. However, due to data availability, we are unable to perform in-depth analysis of other features of FFS reversion cases. Fifth, we did not explore the issue of upcoding because we cannot determine from the data whether upcoding or miscoding had occurred. This issue of upcoding should be explored in further studies. Sivth, only early results based on the first year of post-reform discharge data were analyzed. After 2013, “global budgets” were promoted in some hospitals in Beijing including some hospitals in this study control group. Therefore, the data range involved in this study is only available until 2012. We are unable to observe the mid- and long-term effects of the reform as a result.

5. Conclusions

Introduction of DRG payment in countries with significant economic, social, and health transitions such as China is hoped to curb excessive growth of medical expenses under fee-for-service systems. As demonstrated by this DRG pilot on AMI quality, sole emphasis on costs may reduce the quality of medical care by shifting emphasis away from providing optimal quality. As the purchaser of care and not just the controller of medical expenses, health insurance in China and other countries in transition needs to fully consider the price of care balanced against the quality of care. Countries considering quality improvement systems should be committed to supporting providers to actively institute mechanisms to promote quality of care such as through pay-for-performance.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2019.112590.

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